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SITUATION STATEMENT
DOUGLAS-FIR TUSSOCK MOTH
OREGON - WASHINGTON - IDAHO
May 23, 1974

Introduction

The Douglas-fir tussock moth is usually endemic in western forests and most years not in evidence at all. However, serious outbreaks have occurred several times in the past, notably 1947, 1956, and 1965.

The current Pacific Northwest outbreak first developed in central Washington and the Okanogan Valley in 1971. Some 2,400 acres were affected with about 250 acres seriously damaged. One of the most obvious areas of heavy damage was located near the main highway just west of Cashmere, Washington. Also during 1971, several defoliated ornamental fir trees were observed in Coeur d'Alene, Idaho, the first indication of a potential outbreak building up in northern Idaho.

The outbreak literally exploded in Washington and Oregon during 1972. About 197,000 acres in the States of Oregon and Washington were defoliated to some degree. About 15,000 acres were heavily damaged. Most of the defoliation and damage occurred in the La Grande, Oregon, and Walla Walla, Washington, areas. Substantial numbers of tussock moth egg masses were found in 1972 within a 100-acre timber cutting unit near Charles Butte, St. Joe National Forest, Idaho. However, no visible defoliation was observed during 1972 in Idaho.

Without control, the outbreak continued as expected during 1973 in most areas. However, a number of additional areas became defoliated that had not been predicted. Also, in some areas where only light damage was anticipated, very serious damage occurred. Some 800,000 acres of fir timber type in the States of Idaho, Oregon, and Washington are now defoliated to varying degrees. This includes about 36,000 acres on the Colville Indian Reservation that were not predicted. Of the grand total defoliated, over 88,000 acres have now been very heavily damaged, requiring timber salvage, fire hazard reduction measures, and almost complete rehabilitation. In addition, over 290,000 acres have been less seriously damaged, requiring some timber salvage and at least partial rehabilitation measures.

Most of the accessible private and Federal timber killed by the tussock moth during 1972 has been salvage logged. Much of the timber killed during 1973 has not been salvaged because of the tremendous volumes and large areas involved. However, most of the damaged timber in accessible areas should be salvaged by the end of 1974. A very large fire hazard reduction and rehabilitation job remains to be done. Plans for accomplishing most of the required work have been completed. Some 1.3 million dollars special supplemental funds appropriated by Congress has been made available for fiscal year 1974 use on National Forest lands in Oregon and Washington. This will provide a start on a rehabilitation program that will take over five years to complete.

Hosts--Life Cycle

Douglas-fir, white fir, and grand fir are the preferred hosts for the Douglas-fir tussock moth. However, the caterpillars (larvae) will feed on many other trees and shrubs after the preferred foliage has been eaten. In some of our current outbreak areas, considerable damage to ponderosa pine, subalpine fir, and spruce has occurred. The newly hatched larvae feed on the new needles in the spring. Older needles are consumed as the larvae mature and increase in size. Infested trees begin to turn red from the top down in June. Heavy larval populations are capable of stripping a tree of all its foliage in a single growing season, resulting in tree mortality that same year. Trees less severely damaged are weakened and susceptible to secondary bark beetle attacks. Sometimes only tops of trees are seriously defoliated. Most of these eventually recover, although dead tops may develop.

Tussock moth eggs hatch between mid-May and early June. Newly hatched larvae are about 1/8-inch long and covered with long hairs. This hair and light weight allows them to be carried by the wind for some distance. However, this air transport does not result in significant damage very far from the point of origin. Full-grown larvae are about 1-1/4 inches long. They have two long, dark tufts of hair just back of the head and a similar single tuft on the other end. Four dense, buff-colored tussocks of hair grow along the middle of the back. Larvae feed through July and early August, then spin a cocoon and enter the pupal or "resting" stage. This period lasts from 10 to 18 days depending on temperature when the moths emerge. The female moth is wingless and lays her eggs on the cocoon shortly after she emerges and mates with the winged male. Each female usually lays 150 to 250 eggs.

Biological Evaluation

A very thorough evaluation of the current Oregon-Washington situation was made by Forest Service, Oregon, and Washington forest entomologists during 1972 and early 1973. This indicated that the population was likely to increase within the areas partially defoliated in 1972 and cause considerable damage in 1973. This evaluation also showed that there would be about 449,000 acres defoliated in 1973 and a considerable increase in the area heavily damaged by the tussock moth. A similar evaluation survey made by Forest Service and Idaho entomologists during February 1973 in Idaho substantiated the potential insect buildup and showed that there would be at least 50,000 acres defoliated in Idaho during 1973.

The same type of survey and evaluation with some slight procedural modifications was conducted again during the fall of 1973 and early 1974 in all three States. Some 500,000 acres that have been previously defoliated to some degree, mostly in northeast Oregon and southeast Washington now appear to have gone through the complete insect outbreak cycle and additional damage from the tussock moths is not expected. However, the evaluation shows that on about 455,000 acres, some of which have not yet been defoliated, the insect population (based on insect egg assessments) is sufficient to cause considerable tree damage and mortality during 1974 if not controlled. The tolerable damage threshold level has been established as less than 20 larvae per 1,000 square inches of foliage.

Almost 6,000 egg masses collected in the fall of 1973 from throughout the outbreak area were reared in laboratories this spring to estimate virus incidence, egg parasitism, and egg viability. Although virus incidence ranged as high as 92 percent for an individual plot, most plots had much less than is considered necessary to cause the population to collapse quickly enough to prevent unacceptable damage. These virus treatment criteria thresholds are 30 or 50 percent depending on previous defoliation history. Egg mass size and viability was low in a few areas permitting a reduction in the number of acres predicted to need control in 1974. Based on the fall egg mass survey data alone it appeared that some 649,000 acres would require control. This was reduced to 455,000 using the final data.

Environmental Statements

Because of the large area affected and the possible need to apply chemicals over large forest areas, a National Environmental Policy Act Environmental Statement was prepared after the fall 1972 survey by the Forest Service (Pacific Northwest Region) with assistance from the States of Oregon and Washington, the Northwest Forest Pest Action Council, and others. This was filed with the Council on Environmental Quality (CEQ) in draft form on February 9 and in final form on April 26, 1973.

During the preparation of the 1973 Environmental Statement, it was determined that it might be necessary to use DDT in 1973 to control the outbreak. No other chemical suitable for large-scale forest land aerial application has been proven effective against the tussock moth. Since DDT was no longer registered for use, an emergency-use application was made to the Federal Environmental Protection Agency (EPA) on an "if needed" basis on March 20, 1973. Public response to the Draft Environmental Statement was tremendous. Over 2,000 letters, statements, and signatures were received, mostly from the affected areas. Over 95 percent were in favor of using DDT if it was necessary in order to prevent excessive tree loss during 1973. The request to use DDT was denied by EPA on April 20, 1973.

The current Environmental Statement describing a proposed Douglas-fir tussock moth action program for the three states, Idaho, Oregon, and Washington, was filed in draft form with CEQ on December 28, 1973. Review comments from agencies, organizations, and individuals were due on February 19, 1974, but because of mail delays and other reasons were accepted up until March 14. Over 450 responses were received, considerably less than in 1973, but the number of in-depth substantive responses was about the same. The reduction in total responses received is probably attributable for the most part to the series of Douglas-fir tussock moth public hearings conducted by EPA during January and early February. Many people who gave testimony at these hearings mistakenly thought they were also responding to the Environmental Statement.

The U.S. Department of Agriculture on January 8, 1974, again requested an exemption under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended, for the use of DDT, if needed, to control the tussock moth during 1974. This request was granted by EPA on February 28, 1974 (Federal Register Vol. 39, No. 44).

A Final Environmental Statement proposing to treat at least 408,000 acres with DDT, if needed, in 1974 was filed with CEQ on March 29, 1974. In addition, 45,000 acres of infested lands were set aside to test Bacillus thuringiensis, natural virus, and several chemical insecticides. Further evaluations, reservations for testing other materials, and other research needs have reduced the estimated acres to be treated with DDT to 380,000. An additional 30,000 infested acres have recently been set aside for research population studies and large-scale testing of chemical insecticides. There is an additional 10,000 acres of infestation that is also excluded from the areas recommended for treatment because of 1973 B.t. and virus study and small individual tree insecticide tests planned for 1974. The required statement review period ended on May 13, 1974. A final decision to carry out the treatments as necessary was made by the Forest Service on May 20, 1974.

It may be necessary to treat additional areas if late spring aerial surveys and evaluations indicate that it is necessary. The maximum extent of the area within which areas can be treated has been established in all three States ("Zone of Infestation" in Idaho and "Infestation Control District" in Oregon and Washington). DDT will be applied at the rate of 0.75 pound in one gallon of fuel oil per acre to all areas meeting the predetermined treatment criteria on request by the landowner or land manager.

All spraying will be done with helicopters. The treatment units will be further subdivided into more or less homogeneous blocks. Spraying will start in a block when 70 percent of the insect egg masses have begun to hatch as determined by the entomologist in charge. The first blocks should be ready for treatment about June 1.

All treatments will be very carefully supervised and monitored. Environmental groups and others have been encouraged to visit the areas and observe the operation. A detailed, statistically sound, follow-up survey has been developed which is designed to measure treatment effectiveness in terms of the insect and the amount of tree foliage and trees saved. A complete report of those findings will be published as soon as all of the data have been collected and analyzed.

Douglas-fir Tussock Moth Interagency Steering Committee

Because of the very complex nature of the problem and the need to bring all of the best expertise available in on the development of solutions, an Interagency Steering Committee, composed of key members from the Washington State Department of Natural Resources, Oregon State Department of Forestry, Idaho State Department of Public Lands, Forest Service (both Administration and Research), Bureau of Indian Affairs, Bureau of Land Management, Oregon State University, and the Federal Environmental Protection Agency, was formed in 1973.

The "doing jobs" are accomplished by a technical Working Group composed of members from the Federal and State agencies who have direct responsibility (by law) for forest insect detection and control (Washington State Department of Natural Resources, Oregon State Department of Forestry, Idaho State Department of Public Lands, and the Forest Service). This Working Group coordinates all actions with the Forest Pest Action Councils and other concerned units and groups as needed.

The Steering Committee reviewed and approved the Final Environmental Statement as filed with CEQ. They have also reviewed and approved all project suppression, monitoring, and research plans for 1974.

Treatment Plans for 1974

Dave Graham of the Forest Service (Pacific Northwest Region) and Working Group Chairman, will serve as the over-all tri-Agency, tri-Forest Service Region and tri-State project coordinator. Activities include (1) contacts with the Environmental Protection Agency; (2) contacts with national news media; (3) securing priority fuel allocations (for insecticide carrier, aircraft, and field vehicles--both Federal and State); (4) environmental monitoring; and (5) DDT procurement. Bill Ciesla of the Forest Service (Northern Region) will coordinate all operational and pilot control projects in northern Idaho.

A chemical monitoring plan satisfactory to all three States has been developed. Paul R. (Rod) Canutt, Forest Service, Portland, is the over-all monitoring coordinator. One key coordinator from a State agency in each of the three States was appointed (Warren Westgarth, Oregon Department of Environmental Quality; Don Provost, Washington State Department of Ecology; Woodward Benson, Idaho Department of Environmental and Community Services) and a final monitoring plan has been developed. Water, soil sediment, aquatic organisms, air, big game, fish, small mammals, birds, crops, domestic animals, forest vegetation, and forest litter will be analyzed for DDT residues. Some population-effects monitoring is also included. The total cost of this program is $460,000 of which about $149,000 in services will be contributed by the States as part of the suppression program. The balance of $311,000 will be provided by the Federal agencies involved. Biologists from the various agencies have prepared sample collection plans and have begun to collect pre-spray samples. A special biologist monitoring coordinator has been assigned to each project unit to insure that this particular phase of the project is carried out satisfactorily. A total of $3,018,000 in special supplemental Federal funds was recently provided by Congress for this project. This includes funds for short-term environmental monitoring, chemical suppression, large-scale testing of microbials and cost-sharing 50 percent of the suppression and monitoring costs on State and private ownerships. The States of Oregon, Washington, and Idaho have also provided special State appropriation and private funding as needed.

The Pacific Northwest Region of the Forest Service will provide the over-all administration for all DDT suppression projects conducted in Oregon and Washington. Jack Mounts will be the project director. The Idaho Department of Public Lands will administer all DDT suppression projects in northern Idaho. Dewey Almas will be in charge. The Intermountain Region of the Forest Service will administer all DDT suppression projects in southern Idaho. Galen Trostle will supervise this project.

Seven separate control units and the organization responsible for carrying out the actual suppression project in each have been identified as follows:

| Name | Approx. Size (acres) | Responsible Organization | Unit Supervisor | Unit Headquarters |
|---|---|---|---|---|
| Wallowa | 88,000 1/ | Forest Service | Roy Sines | Enterprise, OR |
| Pomeroy | 44,000 1/ | Forest Service | Mike Conner | Clarkston, WA |
| La Grande | 66,000 | Ore. St. Dept. of Forestry | Roy Woo | La Grande, OR |
| Halfway | 16,000 2/ | Forest Service | Bob Metlen | Halfway, OR |
| Colville | 114,000 | Forest Service | Randy Perkins | Grand Coulee, WA |
| St. Joe | 51,000 | Idaho Dept. of Public Lands | Dewey Almas | Potlatch, ID |
| Sawtooth | 1,200 | Forest Service | Galen Trostle | Fairfield, ID |

Microbial pesticides will be applied to 27,500 acres in a pilot control project on two sites in Idaho. An additional 10,000 acres scattered throughout this area will be left untreated for comparison purposes. The purpose of this large-scale test is to measure the efficacy of nuclear polyhedrosis virus and Bacillus thuringiensis when applied under operational conditions. The Northern Region of the Forest Service will administer the microbial (virus and B.t.) pilot control projects. Project Directors will be Mark McGregor and Jerald Dewey.

A Dipel and Sevin-4-oil pilot project will be conducted on about 1,000 acres near Missoula, Montana by the Montana Department of Natural Resources and Conservation in cooperation with U.S. Plywood and the U.S. Forest Service. Steve Kohler of the State Division of Forestry will be in charge.

A Dylox and Sevin-4-oil pilot project will also be conducted on about 9,000 acres near Halfway, Oregon, by the U.S. Forest Service. George Downing will supervise this operation. The Pacific Northwest and Southwest Forest and Range Experiment Stations will provide technical assistance for all pilot control projects.

1/ This includes about 5,000 acres in Idaho.
2/ About 21,000 acres in addition to this will be treated with test insecticides

RESEARCH ON TUSSOCK MOTH IN 1974

An accelerated research program became possible in 1974 with appropriated supplemental funding made available March 1. Most of the research will be undertaken by the Forest Service's Pacific Northwest and Pacific Southwest Experiment Stations, but considerable work will also be done on contract with universities and colleges. Objectives of the research are to gain a better understanding of the causes of insect population fluctuations and methods of managing populations at acceptable levels. Specific work in progress or planned is as follows:

Laboratory and Airport Studies on Insecticides

Microbial Insecticides (Virus and Bacillus thuringiensis) - Field experiments in 1973, although highly successful, revealed problems which needed further study before the materials are ready for operational use. Specific studies have already been completed, or will be, before the field season begins on such problems as improving carriers for microbial spray formulations; bulk mixing for large area treatment; improved spray equipment, application technology, and spray deposit assessment.

Chemical Insecticides - Field tests in 1973 showed both Dylox and Sevin to be promising candidates for suppressing tussock moth populations. However, problems were encountered in some aspects of aerial application. Research is in progress to solve those problems.

Field Experiments with Insecticides

Microbial Insecticides (Virus and Bacillus thuringiensis) - Followup studies on 1973 studies will be undertaken to: (1) determine the degree of tree mortality and topkill on plots to which six treatments were applied in 1973 and on untreated plots; and (2) determine the extent of tussock moth survival in 1974 in treated and untreated plots. This study area is on the Wallowa-Whitman National Forest about 20 miles north of Enterprise, Oregon.

A new aerial application study will be conducted with virus and Bacillus thuringiensis in northern Idaho, in connection with pilot control tests. The purpose of this experiment will be to (1) test new formulations for improved toxicity and/or ease of handling; (2) test reduced dosages and rates of application (to lower costs); (3) test new spray application equipment; and (4) determine if various commercial Bacillus thuringiensis products are as effective as the one product (Dipel) tested in 1973. The formulations tested will be variations of the molasses formulation tested in 1973. New formulations are now being developed. The treatments will be applied when the majority of the insects are in the second larval instar.

Chemical Insecticides - The Pacific Southwest and Pacific Northwest Experiment Stations will conduct a field experiment to compare the effectiveness of Dylox, Sevin-4-oil, and DDT for control of the tussock moth. The treatments will be aerially applied to plots 40- to 70-acres in size. This study will be conducted in the Wallowa-Whitman National Forest, near Halfway, Oregon. Objectives of the study are to: (1) compare the effectiveness of Dylox and Sevin-4-oil with a standard treatment of DDT (3/4 lb./gal./acre); (2) determine the effect of Dylox, Sevin-4-oil, and DDT on the parasites of

the tussock moth and other nontarget insects; and (3) determine the method, degree, and manner of foliage penetration, target impingement and mode of action of the pesticide under forest conditions.

Aerial application studies will be undertaken in connection with the operational control project, to test the effectiveness of reduced dosages of DDT--1/2 and 1/4 lbs. per acre. Standard application rate is 3/4 lb. per acre. These tests will be made on the Halfway, Oregon, control unit.

Ground application tests will also be conducted. The Forest Service has available, primarily from its Insecticide Evaluation Project at Berkeley, many chemical insecticides that show significant toxicity in the laboratory to the tussock moth. Six to 10 of these materials will be tested in the field in 1974, using spray equipment to apply the materials to individual infested trees from the ground. Three of the materials to be tested are Bioethanomethrin, Resmethrin, and Zectran; others are being selected. Techniques are available to approximate dosages and drop-size that would be obtained from aircraft. The experiments will be repeated and treatment effects evaluated statistically. These tests will be conducted in the Sled Springs area northeast of Enterprise, Oregon.

Other Research to be Undertaken in 1974

A major area of study concerns determining the population dynamics and impacts of the tussock moth. Because populations are so cyclic, it is urgent that as much as possible be learned from the present outbreak. New and continuing studies include the following:

1. Evaluation of the changes which occur in insect population density as related to degree of tree defoliation, disease, parasites, predators, and other natural factors. Results will be used to construct a pest management model to predict insect population trends and defoliation.

2. Determination of the amount of tree mortality and damage occurring in areas that have been defoliated to varying degrees.

3. Identification of forest stands and habitat types most susceptible to defoliation.

4. Evaluation of the impact of the present outbreak on tree seed production, forest regeneration, watershed values, and fire hazards.

Another sizable research effort concerns identification and synthesis of the sex attractant of the tussock moth. One of the problems with tussock moth outbreaks is that they build up very rapidly. By the time foresters are aware the insect population is increasing, considerable damage has already been done. Better early warning systems are needed to detect outbreaks while they are still small. The tussock moth has a sex attractant and there is good indication that it can be isolated, synthesized, and perhaps deployed as a "survey" tool to keep track of the numbers of tussock moths in the woods. Chemical aspects of the research are being conducted under a research grant to the Oregon Graduate Center in Beaverton, Oregon. Laboratory and field testing is being done at the Forest Service's Forestry Sciences Laboratory in Corvallis, Oregon.